Atmos. Chem. Phys. Discuss., 12, C13132–C13136, 2013
www.atmos-chem-phys-discuss.net/12/C13132/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Could aerosol emissions be used for regional heat wave mitigation?" *by* D. N. Bernstein et al.

D. N. Bernstein et al.

neelin@atmos.ucla.edu

Received and published: 5 March 2013

We would like to thank the referee for the helpful comments on the manuscript.

In reply to the major comments, and with numbering following each comment's number (page and line numbers refer to the original manuscript for consistency with the review):

1. Regarding p 2379, line 27: Apparently one of our sentences was unclear. We are not making the claim that the reviewer understood. In fact, this was a sentence that was inserted as an additional caveat in response to pre-review comments that we received from colleagues when we circulated the paper pre-submission. We have now deleted the portions of the sentences that seemed to be at issue, and have modified the paragraph accordingly. Regarding the reviewer's suggestion that the authors could make a

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

substantial push for geoengineering, we thank the reviewer for this comment, and we have made a number of changes to the phrasing of our conclusions to take the Referee's suggestions into account. We have attempted to make our phrasing as neutral as possible while acknowledging caveats and attempting to provide such information as we can within the context of this study. In pre-review circulation and discussion with colleagues, we had comments that were of a different direction, and we want to try to acknowledge both sides of this debate. (We also note that such studies are read by larger community than scientists in the field, as we found in having to turn down press inquiries regarding the discussion paper, and so some discussion of related literature in general terms seems appropriate.) In places where we express concern about geoengineering methods, these instances are citing results from the literature that have raised this concern, which is appropriate to do. Based on comments we have received from colleagues in the field, it is important to have some caveats on the overall aspects of this. And attempting to address this balance, we have made a number of modifications in section 6 in the direction suggested by the reviewer. These include: -searching throughout for terms of phrase that might be misread, such as in the introduction replacing "into vogue again" by "into renewed discussion", and adding some references. -substantial rephrasing in the third last paragraph of the conclusions to first more carefully frame a point of view consistent with that advocated by the reviewer - Inclusion of a reference to possible workarounds for some of the side effects in the fourth last paragraph of the conclusions, along with expanded discussion of oversight possibilities. -adapting a sentence in the second last paragraph to a more neutral statement. -In the last paragraph, we agree that "prevent considering them a good alternative" was too strong, so we have rephrased the statement of consistency with prior literature.

2. Regarding the aerosol emission and WRF-Chem set-up: We added sentences in Section 2 to clarify this point. We itemize reasons that using the setup developed for air quality simulations in WRF Chem is useful and spelled out that we are not assuming these particles are being formed from the gas phase. We also discussed the reasons for the standard practice following for size bins and the reasons for usefulness of conti-

ACPD
12, C13132–C13136, 2013

nuity with this practice. The reviewer may be thinking of studies such as Heckendorn et al. (2009), which considers the case of gas phase injection and steady-state distributions applicable to the global case. Here the time scale is a day, so the behavior regime and the assumptions differ in certain respects. We are indeed making an aerosol injection assumption, not a gas phase assumption. We have inserted a sentence in Section 3.2 that restates these caveats and again references Heckendorn et al. (2009) so that it will be clearer for the reader what assumptions might impact this.

3. Regarding the reviewers concern re our phrasing of the discussion related to feasibility and sustainability of geoengineering: We made substantial changes to the discussion in section 6 (especially the four last paragraphs) to acknowledge the argument outlined by the reviewer. We have also added sentences to make some of the connections more specific between our estimates of the amount of aerosol required for this application and the height of injection that might be chosen for the regional application with considerations raised in other studies. The new figure (Fig. 11), added in response to comment 4, also helped to provide background for the discussion of the height of injection relevant to potential downstream side effects. We also note that this discussion partly reflects comments we have received from colleagues in separate circulations of the manuscript. We do not want to overstate concerns about feasibility and sustainability, but we aim for balance in carefully acknowledging those concerns. Hopefully our revised wording will attempt this balance in a manner more satisfying to the reviewer.

4. We have added a figure (new Figure 11) with a vertical distribution of the aerosol, temperature changes and flow field. This and the associated several paragraphs of discussion added at the end of section 3.3 add substantially to the analysis and discussion âĂŤthanks very much for the suggestion. Regarding showing corresponding figures on consecutive days, we have this reduced the number of panels associated with the second day (Fig. 5) in response to the reviewer's suggestion. It seems useful to keep a number of the second-day figures since they provide a visual way of indicat-

ACPD

12, C13132–C13136, 2013

ing to what extent the effects are similar despite differences in the meteorology on the two days, which the Referee 3 asked us to elaborate on.

Regarding the reviewer's concluding remarks, we note again that we have modified our conclusions in the last several paragraphs of the Discussion section to include the reviewer's argument (while trying to maintain balance with multiple other comments we have received as discussed above).

Minor Comments:

p. 23795, line 25-26: We thank the reviewer for the comment. We have inserted a clarifying phrase based on the reviewer's comment.

p. 23796, line 24-27: we modified the sentence so that the time scales are more clearly broken out.

p. 23798, line 17-19: wording corrected

p. 23799, line 22: wording corrected

p. 23799, line 23: The altitude is been specified as requested; we have also made the reference to this injection altitude more precise at other locations in the text for consistency.

p. 23799, line 26-29: We inserted a clarification on this in section 2, in the context of responding to comment 2.

p. 23801, line 19: We added a figure (Fig. 11a) to show the vertical distribution of the aerosol and added a paragraph near the end of Section 3.3 explaining it. This addition of the vertical profiles is coordinated with vertical wind and temperature profiles added in reply to Major Comment #4.

p. 23803, line 14-14: the order of the references to the figures is corrected

p.23804, line 1-2: This is also clarified in the added paragraph in section 2 (see

ACPD

12, C13132–C13136, 2013

changes in response to comment 2).

p. 23806, line 25-27: Good suggestion, we have added the aerosol mass associated with each experiment in Table 1, as requested (we used total aerosol mass because this is what is injected, as clarified in response to the reviewers earlier comment).

p. 23807, line 10-23: We considered the reviewers suggestion, and found splitting discussion and conclusion made the flow of the discussion a little difficult to follow. Section 5 is short but makes a coherent point that might otherwise get lost, so we kept the structure.

p. 23809, line 5-7: This is clarified in added paragraphs at the end of section 3.3, where the added figure (now Fig. 11) of vertical profiles suggested by the reviewer proves very useful for making this point.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 23793, 2012.